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# Digestive tract helminths of Turkish ibex (*Capra aegagrus aegagrus* Erxleben, 1877)

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**Summary:** Turkish ibex or wild goat (*Capra aegagrus aegagrus* Erxleben, 1877) is known to be distributed in Southeast Europe and Western Asia. In Turkey, the species is distributed in Eastern, Northeastern and steep mountainous areas of Southeast Anatolia. Antalya province is one of the main areas where Turkish ibex are currently found and where the species has had a long history. Digestive tracts of two male wild goats (*Capra aegagrus aegagrus*) were examined at necropsy from Antalya province, Turkey for gastrointestinal helminth infections. In total 3917 helminth parasites were collected and identified by morphological characteristics. Seven species of trichostrongylid nematodes were identified. *Marshallagia marshalli* and *Telodorsagia circumcincta* were the most abundant abomasal nematodes whereas *Nematodirus abnormalis* was dominant in the small intestine. This is the first report of helminths from *Capra aegagrus aegagrus* (sub-species of wild goat). Comparison with previous reports conducted on domestic goat and sheep in the nearby areas suggests that transmission of parasites between wild goat and domestic small ruminants is occurring.

Keywords**:** *Capra aegagrus aegagrus,* digestive tract, helminth, trichostrongylidae, Turkish ibex.

## Türk yaban keçilerinde (*Capra aegagrus aegagrus* Erxleben, 1877**) sindirim sistemi helmintleri**

**Özet:** Güneydoğu Avrupa ve Batı Asya'da da yayılış gösteren Türk dağ keçisi veya yaban keçisi (*Capra aegagrus aegagrus* Erxleben, 1877) Türkiye'de doğu, kuzeydoğu bölgeleriyle güneydoğunun dik yamaçlarında görülmektedir. Uzun süredir ve günümüzde de yayılış gösterdiği Antalya yöresi, Türk dağ keçisinin temel yayılım alanlarından biridir. Çalışmada, Antalya yöresinden elde edilen iki erkek dağ keçisi nekropsi yapılarak mide bağırsak helmintleri bakımından incelenmiş, toplam 3917 helmint toplanarak morfolojik özelliklerine göre tür teşhisleri yapılmıştır. Trichostrongylid nematodlardan 7 türün tespit edildiği araştırmada, en yaygın türler olarak *Marshallagia marshalli, Telodorsagia circumcincta*'ya abomasum'da, *Nematodirus abnormalis*'e ise ince bağırsaklarda rastlanmıştır. Bu çalışma ile ilk kez yaban keçisi alt türü olan *Capra aegagrus aegagrus*'un sindirim sistemi helmint türleri belirlenmiştir. Çalışmanın yapıldığı bölgelere yakın alanlarda evcil keçi ve koyunlar üzerinde daha önce yürütülen araştırmalarla bu çalışmada elde edilen sonuçlar karşılaştırıldığında, Antalya yöresinde yaşayan yaban keçileri ile evcil küçük ruminantlar arasında paraziter enfeksiyonlar bakımından karşılıklı bulaşmanın söz konusu olabileceği sonucuna varılmıştır.

Anahtar sözcükler**:** *Capra aegagrus aegagrus,* helmint, sindirim sistemi, trichostrongylidae, Türk yaban keçisi.

## Introduction

Wild goat or Turkish ibex (*Capra aegagrus aegagrus* Erxleben, 1877) is known to be distributed in Southeast Europe and Western Asia. In Turkey, this sub-species are distributed in Eastern, Northeastern and steep mountainous areas of South East Anatolia. Antalya province is one of the main areas where Turkish ibex are currently found and where these species has had a long history (11). Epidemic diseases, overgrazing, uncontrolled hunting and progressive destruction of natural habitats play an important role in significant decline of the wild goat population in Turkey. For this reason, hunting of young and female ibexes were prohibited in 1937 and male ibex was prohibited in 1955. The measures taken over the years led to an increase in the number of wild goat. The most recent estimates suggest existence of 22,615 ibex in Turkey and existence of 6,373 ibex in Antalya province (20). Currently, it is allowed to hunt the ibex according to the decisions of the Central Hunting Commission under the Land Hunting Law Coded 4915 in 2003.

Knowledge of the parasitic diseases of wildlife focus on protecting endangered species (9, 14, 16). Parasite infection can lead to a reduction in population size and may ultimately contribute to extinction of species (19). Therefore, it is important to investigate and document the prevalence of parasites among threatened species. At the same time, parasitological studies are important to

understand ways of the potential transmission and interaction of parasites between species, both wild and domestic animals (12, 17). Although various gastrointestinal helminth species have been reported in various ibex species (1, 3, 4, 15), this is the first report of parasites recovered from *Capra aegagrus aegagrus* according to a search of the available literature. The aim of the present study was to describe the gastrointestinal helminth fauna recovered from two Turkish ibex in Turkey.

## Materials and Methods

*Study animals and area:* Under the Central Hunting Commission decision, two male Turkish ibex aged 9 and 7 years old were hunted in Antalya province, Turkey between July and August. One of the two goats was hunted in Düzlerçamı (Çetin deresi) where is located between $37^0$ 04' 05.43" N and $30^0$ 31' 30.62" E latitudes, the other was hunted in Finike (Arif köyü) where is located $36^0$ 32' 27.08" N $30^0$ 04' 30.57" E latitudes. As soon as possible, after removal of the alimentary tract from the body cavity, the organs were ligated at various anatomical sites and then were brought to Department of Parasitology, Faculty of Veterinary Medicine, University of Ankara, for parasitological examination of their digestive tracts.

*Worm recovery and count:* For collected worms from the dissected animals, the digestive system organs were separated by ligating sites. Gut contents were first filtered through 150 µm sieve and then all contents were examined using a stereo microscope. Every parasite recovered from the gastrointestinal organs was cleaned with physiological saline, fixed in hot 70% alcohol, and identified morphologically (2, 4, 13, 21, 22) with a light microscope (Nikon Eclipse E 600). After identification, parasites were micro-photographed (Nikon DXM 1200 F camera) and preserved in ethanol-glycerin-formalin protective solution.

## Results

The identified helminths from the digestive tract of *Capra aegagrus aegagrus* were classified to the phylum Nemathelminthes, class Nematoda, order Strongylida, superfamily, Trichostrongyloidea family Trichostrongylidae, genres *Marshallagia* and *Teladorsagia*, species: *Marshallagia marshalli* (Figure 1 a, b, c); *Teladorsagia circumcincta* (Figure 2 a, b, c, d); *T. occidentalis, T. trifurcata* (Figure 3 a, b), in the abomasum, also genres *Nematodirus* and *Trichostrongylus*, species: *N. abnormalis* (Figure 4 a, b, c); *N. spathiger* (Figure 5 a, b), *T. colubriformis* (Figure 6 a, b, c), in the small intestine.

Figure 1. *Marshallagia marshalli* a) the stoma b) the tail of female c) caudal end of male.
Şekil 1. *Marshallagia marshalli* a) stoma b) dişi kuyruk bölgesi c) erkek arka uç.

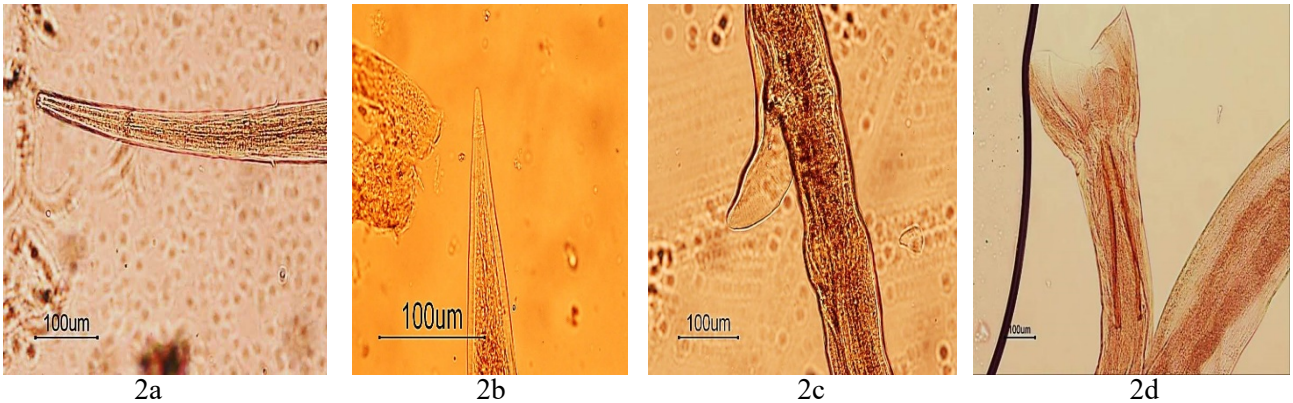
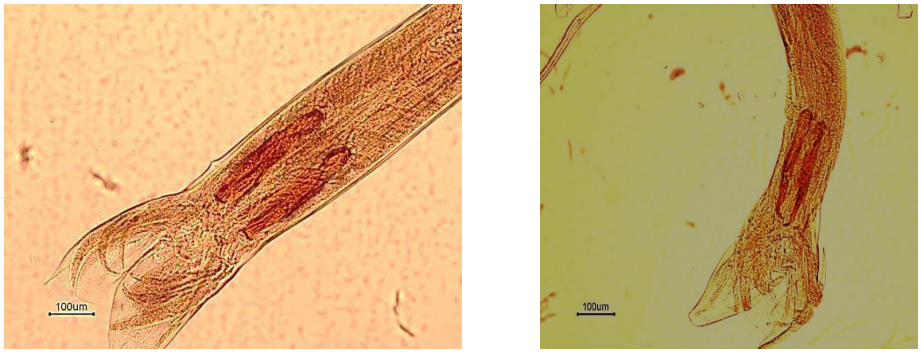



Figure 2. *Teladorsagia circumcincta* a) the stoma b) the tail of female c) vulvar flap of female d) caudal end of male.
Şekil 2. *Teladorsagia circumcincta* a) stoma b) dişi kuyruk bölgesi c) dişi vulva kapağı d) erkek arka uç.

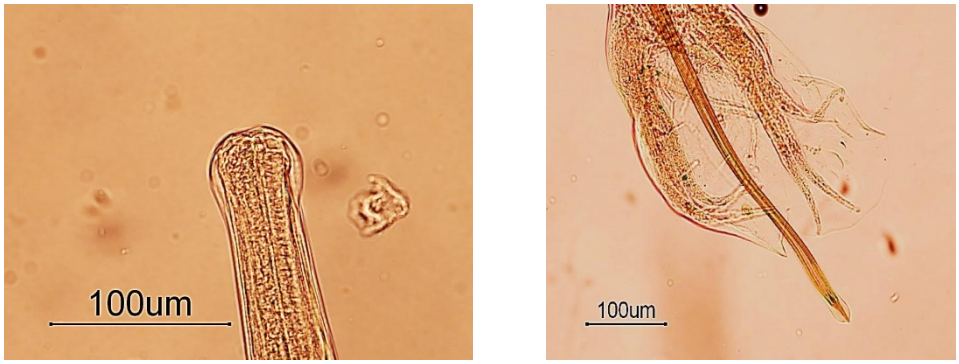



3a 3b

Figure 3. a) Caudal end of male of *Teladorsagia occidentalis* b) Caudal end of male of *Teladorsagia trifurcate.*
Şekil 3. a) *Teladorsagia occidentalis* erkek arka uç b) *Teladorsagia trifurcate* erkek arka uç.

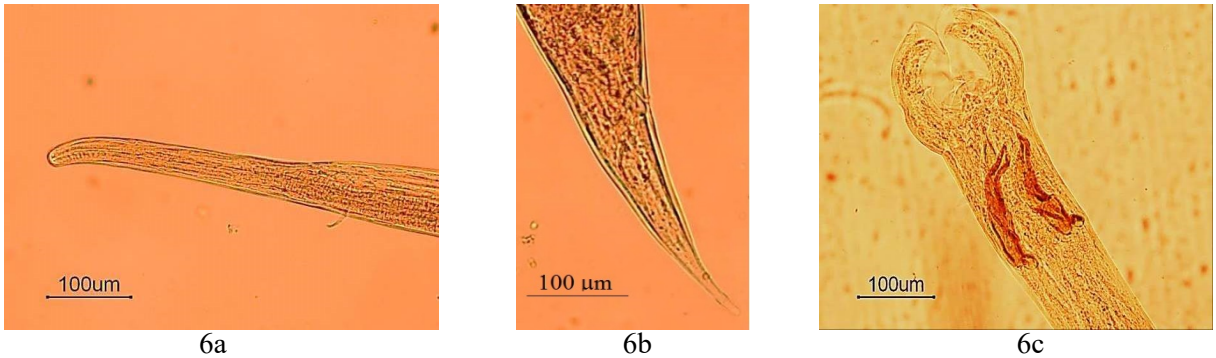
4a 4b 4c

Figure 4. *Nematodirus abnormalis* a) the stoma b) the tail of female with a spin c) caudal end of male.
Şekil 4. *Nematodirus abnormalis* a) stoma b) diken taşıyan dişi kuyruk bölgesi c) erkek arka uç.




5a 5b

Figure 5. *Nematodirus spathiger* a) the stoma b) the caudal end of male.
Şekil 5. *Nematodirus spathiger* a) stoma b) erkek arka uç.




6a 6b 6c

Figure 6. *Trichostrongylus colubriformis* a) the stoma b) the tail of female c) caudal end of male.
Şekil 6. *Trichostrongylus colubriformis* a) stoma b) diken taşıyan dişi kuyruk bölgesi c) erkek arka uç.

Table 1. The nematode fauna recovered from the digestive tracts.
Tablo 1. *S*indirim sistemlerinden elde edilen nematodlar.

| Helminth species | Localization | Animals | Nematode males | | Total nematode males | Nematode females | | Total nematode females | Total nematodes |
|---|---|---|---|---|---|---|---|---|---|
| *Marshallagia marshalli* | Abomasum | 2 | 554 | 162 | 716 | 540 | 139 | 679 | 1395 |
| *Teladorsagia circumcincta* | Abomasum | 2 | 342 | 243 | 585 | 499 | 242 | 741 | 1326 |
| *Teladorsagia occidentalis* | Abomasum | 2 | 15 | 5 | 20 | 5 | 2 | 7 | 27 |
| *Teladorsagia trifurcata* | Abomasum | 1 | 3 | 0 | 3 | 0 | 0 | 0 | 3 |
| Total nematodes in abomasum | | | 914 | 410 | 1324 | 1044 | 383 | 1427 | 2751 |
| *Nematodirus abnormalis* | Small intestine | 2 | 781 | 88 | 869 | 109 | 12 | 121 | 990 |
| *Nematodirus spathiger* | Small intestine | 2 | 147 | 13 | 160 | 7 | 3 | 10 | 170 |
| *Trichostrongylus colubriformis* | Small intestine | 1 | 3 | 0 | 3 | 3 | 0 | 3 | 6 |
| Total nematodes in small intestine | | | 931 | 101 | 1032 | 119 | 15 | 134 | 1166 |
| Total nematodes in digestive tract | | | 1845 | 511 | 2356 | 1163 | 398 | 1561 | 3917 |

The number of worms are indicated and their locations in two Turkish ibex are given in Table 1. Mix infections were seen and in total seven nematode species were detected in abomasum and small intestine. No worms were detected in the large intestine of the examined animals.

## Discussion and Conclusion

This study showed that *Capra aegagrus aegagrus* is a host for a number of digestive nematode species. The studied animals were both adult males and it may be that other infections are associated with younger animals. The findings were compared with previous studies on helminth infections in related species in different countries: *Rupicapra R. rupicapra* (Alpine chamosis) (7), *Capra walie* (Walia ibex) (5), *Capra ibex ibex* (Alpine ibex) (15), *Capra pyrenica* (Spanish ibex) (1, 18) and West African Dwarf goat (Nigerian dwarf goat) (6). *Marshallagia spp*., *Nematodirus spp*., *Ostertagia spp*. and *Trichostrongylus spp*., which were also detected in this study, were the most commonly mentioned helminth genres of these other wild goats' species.

Helminth parasites of the digestive tract are also widespread among domestic sheep and goats in Turkey (8, 10). Two studies have considered endoparasites of domestic goats and sheep in areas close to where this study was performed (23, 24) and *Ostertagia ostertagi, Teladorsagia circumcincta, T. occidentalis, T. trifurcata, Haemonchus contortus, Marshallagia marshalli, Trichostrongylus axei, T. probolurus, T. vitrinus, Nematodirus abnormalis, N. spathiger, N. filicollis* have all been detected as gastrointestinal helminth infections. The most common species in the abomasum and in small intestine were *M. marshalli* and *N. abnormalis*. The same seven nematode species reported here were found in the abomasum and small intestine of domestic ruminants. It seems that parasites are circulating between wild and domestic ruminants in the study area. Most importantly it may be that the wild goat is acting as a reservoir for some of these infections and may provide a refuge for the parasites away from drug treatment.

This is the first report of the gastrointestinal nematodes fauna of two *Capra aegagrus aegagrus* in Turkey. The study underlines the need for further studies that may help to design appropriate strategies to the control of helminth parasites in *Capra aegagrus aegagrus*. It is possible that Turkish ibex can serve as a source of infection of gastrointestinal nematodes for domestic livestock in their living area. In addition, there is a need to further investigate the ecology, seasonality and impact of parasites in wild goat populations in Turkey.

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